

**U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE**

HEARING CHARTER

An Overview of the Federal R&D Budget for Fiscal Year 2006

**Wednesday, February 16, 2005
11:00 a.m. - 1:00 p.m.
2318 Rayburn House Office Building**

1. Purpose

On Wednesday, February 16, 2005, the House Science Committee will hold a hearing to consider President Bush's fiscal year 2006 (FY06) budget request for research and development (R&D). Five Administration witnesses will review the proposed budget in the context of the President's overall priorities in science and technology. The Science Committee will hold a separate hearing on February 17th to examine the budget request for the National Aeronautics and Space Administration (NASA).

2. Witnesses

Dr. John H. Marburger III is Director of the Office of Science and Technology Policy (OSTP), the White House science office. Prior to joining OSTP, Dr. Marburger served as President of the State University of New York at Stony Brook and as Director of the Brookhaven National Laboratory.

Dr. Samuel W. Bodman is Secretary of the Department of Energy (DOE). Prior to joining DOE, Secretary Bodman served as Deputy Secretary of the Treasury and, before that, Deputy Secretary of the Department of Commerce (DOC). He also has served in executive positions in several publicly owned corporations, and as a professor of chemical engineering at the Massachusetts Institute of Technology.

Dr. Arden Bement is the Director of the National Science Foundation (NSF). Prior to his appointment as NSF Director, Dr. Bement was Director of the National Institute of Standards and Technology (NIST) and before that he was professor and head of the School of Nuclear Engineering at Purdue University.

Mr. Theodore W. Kassinger is the Deputy Secretary of the Department of Commerce. Previously, Mr. Kassinger served as the General Counsel of the Department.

Dr. Charles E. McQueary is the Under Secretary for Science and Technology (S&T) at the Department of Homeland Security (DHS). Prior to joining the Department, Dr. McQueary served as President of General Dynamics Advanced Technology Systems, and as President and Vice President of business units for AT&T, Lucent Technologies, and as a Director for AT&T Bell Laboratories.

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4. Background

Overall Budget

On February 7, 2005, President Bush delivered his FY06 Federal budget to Congress. Overall discretionary spending is increased by 2.1 percent – roughly equivalent to projected inflation. Consistent with budgets of recent years, discretionary account increases are focused heavily on Department of Defense (DOD) and Department of Homeland Security (DHS) activities, which grow by just under 5 and 7 percent, respectively. Non-defense, non-homeland security discretionary spending is reduced by nearly 1 percent.

Research and Development (R&D) Budget

The President's R&D budget proposes to spend \$132.3 billion, an increase of \$733 million, or 1 percent, over FY05.¹ The largest increases for R&D go to the National Aeronautics and Space Administration (NASA, \$537 million, or 4.8 percent), DOD (\$417 million, or 0.06 percent), and DHS (\$282 million, or 23.8 percent). All other agencies collectively receive an average decrease of 1.0 percent. The 1 percent R&D growth reflects increases in development (\$1.2 billion, or 2 percent).² Applied research (\$3 million, or 0.0 percent) and basic research (-\$320 million, or -1.2 percent) are flat and slightly lower, respectively.

Science and Technology Budget

The Federal Science and Technology (FS&T) budget is a way of presenting the budget that was recommended by the National Academy of Sciences; it focuses on spending for actual research by excluding areas such as defense development, testing, and evaluation. In the FY06 budget, funding for FS&T declines by 1.4 percent, to \$60.8 billion. The FS&T budgets of DOC and DOE are particularly affected, receiving 14 percent and 5 percent cuts, respectively.

Administration Highlights and Perspective

Consistent with the President's overall budget priorities, the request for R&D focuses on homeland security and defense spending while limiting the growth in overall spending. The Administration argues that science, technology, and innovation are given relative priority in the budget, noting that non-defense budget authority declines by 0.26 percent, while non-defense R&D budget authority is increased by 0.74 percent.

The Administration also emphasizes several ways of looking at the R&D budget that go beyond year-to-year proposals. For example, the budget notes that in FY06, 13.6 percent of total discretionary outlays will go to R&D, the highest share since 1968 and the heyday of the Apollo program. The budget also compares the request level for many agencies and programs to FY01, underscoring the fact that overall R&D has increased 45 percent since 2001 (an annualized rate of 7.7 percent), and funding for NSF and NASA have increased by 25 and 19 percent, respectively, since FY01.

Critics counter that figures based on R&D do not give a clear picture of what has been happening to research because the category is so weighted toward development. They also point out that even in the

¹ A complete federal R&D spending table is provided at the end of the charter in Appendix II.

² Defense development is by far the largest factor in the overall R&D increase, accounting for \$1.4 billion in added spending.

research category some agencies have done far better than others. DOD alone accounts for almost 70 percent of R&D increases over the last five years, and the National Institutes of Health (NIH) and DHS account for almost 75 percent of the remaining civilian R&D increases. During that same period, trends at other agencies range from modest increases (DOE: 10 percent, and that includes defense development programs) to modest cuts (DOC: -4 percent; EPA: -5 percent). Critics also note that the figures that start in FY01 are based on final appropriations, which reflect Congressional as well as Administration actions. Similarly, critics note that the figures that start with FY01 include Congressional earmarks, which for other purposes (see below), the Administration backs out of its baseline spending figures.

For a number of science agencies (perhaps most notably the National Oceanic and Atmospheric Administration, or NOAA), the Administration argues that it is proposing significant programmatic increases even though the total proposed for FY06 is below that for FY05. That is because the FY05 number includes numerous Congressional earmarks for specific grants. The Administration argues that the earmarks should be removed from the FY05 baseline to get a truer picture of what is being proposed. The budget document reflects the Administration's continued and growing concern over Congressional earmarks within R&D accounts. The budget cites a study by the American Association for the Advancement of Science that calculated that earmarks for R&D at academic institutions increased by 9 percent from 2004 to 2005, and now total over \$2.1 billion – up from \$296 million only ten years ago. *The Chronicle of Higher Education* has estimated that R&D earmarks now account for 8 percent of all federal funding to colleges and universities.

The Administration also emphasizes that evaluations of agency and program management are considered in determining proposed budgets. Agencies are evaluated by the Executive Branch Management Scorecard, which rates agencies with green, yellow and red lights in areas such as financial management, e-government, and human capital management. Agencies under the Science Committee's jurisdiction scored very well on these evaluations. Of the 26 agencies evaluated, DOE, NASA, and NSF were three of only seven to receive three or more green lights.

5. Primary Issues

Here are some key questions raised by the FY06 budget request along with relevant background:

Overall Funding Levels and Balance

Regardless of how science fares in the proposed FY06 budget in comparison with other program areas, the figures are unarguably quite tight and are projected to remain so for several years. **What would the impact of such austerity be on the research agenda, on U.S. leadership in science and technology, on the production of future scientists and engineers?** The budget also would do little to increase the relative strength of research in the physical sciences, which have fallen far behind the biological sciences as a percentage of the federal research budget. Increasing the relative strength of the physical sciences has been a priority of the scientific community (including the President's Council of Advisors on Science and Technology, or PCAST) and of the Congress, as reflected in several Science Committee bills that have been signed into law in the past four years, including the NSF Authorization Act of 2002, the 21st Century Nanotechnology Research and Development Act, and the Cyber Security Research and Development Act. All of those laws authorize significantly more for the physical sciences than has been provided in appropriations or in the FY06 request.

Basic Research at the Department of Energy

The debate over the relative strength of the physical sciences often focuses on funding for the Department of Energy (DOE) Office of Science, which is a major source of funding for the physical sciences.

Congress last year provided an increase of almost 4 percent for the Office – the first significant growth in many years – but the FY06 budget would reduce funding for the Office by almost 4 percent (or by about 2 percent if earmarks are removed from the FY05 baseline). The impact on grants to individual researchers would be far larger, perhaps as great as a 10 percent cut, because so much of the Office’s budget is spent on the costs of large user facilities run by the National Laboratories. **How high a priority should research at the Office of Science be in the President’s budget?** The Office of Science has not fared well in budget requests compared to the National Science Foundation, which is in many ways a “sister agency” that focuses on basic research.

Applied Energy Research

Funding for applied research in the FY06 budget is focused on a few long-range initiatives, such as the President’s hydrogen initiative. Excluding the hydrogen/FreedomCar activities, energy efficiency and renewable energy R&D for FY06 would be cut by 11 percent, to \$687 million. **Does the budget appropriately balance funding for technologies that could be deployed in the nearer term with research on long-run advances like hydrogen?** The budget also proposes the elimination of DOE’s oil and gas R&D, which have been rated as “ineffective” by the Office of Management and Budget. **Is the elimination of these programs warranted?**

NSF Education Funding

The FY06 budget request cuts the Education and Human Resources (EHR) account at NSF by 12 percent (and by 22 percent below the FY04 level of \$ 938 million). NSF has indicated that the reductions in elementary, secondary and undergraduate education are part of a conscious policy to significantly pare its role in program implementation, allowing these to migrate to the U.S. Department of Education. **Should NSF continue to play a significant role in science and math education at all levels of schooling?**

Technology Programs at the National Institute of Standards and Technology (NIST)

While the internal laboratories at NIST are slated to receive a 12 percent increase in the FY06 budget proposal, the President proposes to eliminate the Advanced Technology Program (ATP) and to halve the budget for the Manufacturing Extension Partnership program (MEP). Both programs were created by Congress in 1988. ATP, long a source of controversy, provides grants to companies for pre-competitive research. MEP runs centers, partly funded by states, throughout the country to help smaller manufacturers take advantage of the latest technology. Last year, the budget proposed to eliminate MEP, but the Administration later retreated from the proposal. **Should ATP and/or MEP be eliminated? How high a priority are they compared to other activities at NIST?**

6. Interagency Research Activities

The Administration has not proposed any new interagency R&D initiatives for FY06.

National Nanotechnology Initiative (NNI): NNI, interagency program that coordinates Federal support for nanoscale R&D, continues to be a high priority of both the Administration and the Science Committee. Between FY01 and FY05, spending on federal nanotechnology R&D more than doubled, rising from \$464 million in FY01 to \$1.1 billion in FY05. The FY06 budget requests an estimated \$1.05 billion for the program in FY06, a decrease of \$27 million, or 2.5 percent, from the estimated FY05 level.³ Requested funding for the five agencies⁴ authorized in the *21st Century Nanotechnology Research*

³ The budget estimates agency funding levels for the National Nanotechnology R&D Program activities, but the data are not entirely consistent from year to year. This is in part because discrepancies arise due to the fact that some nanotechnology research is difficult to identify or classify.

and Development Act (P.L. 108-153) is \$666 million, which remains well below the \$890 million authorized for these agencies for FY06 in the Act.

Networking and Information Technology R&D (NITRD): NITRD is described as a “collaborative effort of many Federal agencies [and] the Nation’s principal source of long-term, fundamental information technology (IT) R&D, including advanced technologies in high-end computing systems and software, high-speed networking, software assurance and reliability, human-computer interaction, and information management.” For the fourth straight year, the budget request does not include an increase for NITRD. This year, the request is \$2.2 billion, a 4.5 percent decrease below the estimated FY05 level. A significant part of this decrease is due to a reduction in funding at NASA, which is redirecting funds from a number of programs to better support the President’s vision for space exploration. Within NITRD, the work on High End Computing R&D is down 6 percent, due in part to a drop in funding in this area at DOE Office of Science.

Cybersecurity R&D: Proposed funding for cybersecurity R&D programs remains flat. At NSF, the budget requests \$67.5 million for cybersecurity R&D (up 2 percent), but proposes cutting funding for cybersecurity-focused education programs (down 27 percent to \$12 million). At NIST, the request is \$19 million for cybersecurity R&D (the same level as in FY05). All of these proposed funding levels are significantly below the levels authorized in the *Cyber Security Research and Development Act* (P.L. 107-305).⁵ Within the DHS Science and Technology (S&T) Directorate, the FY06 budget requests \$16.7 million for cybersecurity R&D, down 7 percent from the FY05 level.⁶

Climate Change Research: The FY06 budget requests \$1.9 billion for the interagency Climate Change Science Program (CCSP), about the same level as enacted in FY05. There is a \$100 million (8 percent) decrease in NASA’s contribution to CCSP, offset primarily by a \$57 million (46 percent) increase in NOAA and a \$15 million (21 percent) increase in USDA’s contributions to the program. The request for CCSP includes \$183 million for the interagency Climate Change Research Initiative (CCRI), a 17 percent decrease above the FY05 enacted level. It is unclear why CCRI was reduced when these activities have been a high priority for the Administration in past years. CCRI is intended to target critical scientific uncertainties and deliver results in three to five years.

The National Earthquake Hazard Reduction Program (NEHRP): NEHRP is an interagency effort aimed at reducing earthquake hazards through activities such as seismic and engineering research, earthquake monitoring, and code development and adoption. It includes NIST, NSF, the U.S. Geological Survey (USGS), and the Federal Emergency Management Agency (FEMA). The complete NEHRP budget for FY06 has not yet been provided to the Committee. However, the NSF request is \$53.98 million, roughly flat compared to FY05, and USGS receives \$51.34 million, up from \$46.89 million in FY05. Included in the USGS NEHRP budget is \$8.2 million for the Advanced National Seismic System (ANSS). In FY05, NIST and FEMA were funded at \$1.8 and \$20.5 million, respectively. The Committee remains concerned that NIST NEHRP funding will not be sufficient to carry out its new responsibilities as the lead agency for NEHRP.

⁴ The five agencies authorized by the Act are: NSF, DOE, NASA, EPA, and NIST. The total funding authorized by the Act for these agencies is \$3.7 billion over four years.

⁵ For FY06, NSF cybersecurity programs are authorized at \$134 million and NIST cybersecurity programs are authorized at \$77 million.

⁶ DHS also supports operational cybersecurity programs, such as national alerts about existing computer and network vulnerabilities. Located in the National Cyber Security Division of the Information Analysis and Infrastructure Protection Directorate, operational cyber security receives roughly \$73 million (a \$6 million increase) in FY06.

7. Agency R&D Highlights

Department of Energy (DOE)

The FY06 request for civilian R&D at DOE of \$5.4 billion represents a decrease of 5 percent from FY05 enacted levels. The Administration's top funding priorities for energy science programs are hydrogen R&D, operating funds for scientific user facilities, and fusion research.

Office of Science

The budget proposes cutting funds for the Office of Science by \$137 million (-4 percent), to \$3.46 billion. The budget request indicates a higher priority for operating funds for scientific user facilities. The request includes double digit funding for the operations of new facilities such as the Spallation Neutron Source (+\$74 million) at Oak Ridge National Laboratory and four new Nanoscale Science Research Centers (+\$43 million), and a 10 percent cut for funding for research grants.

The budget proposes to cancel plans for the physics facility at the Fermi National Laboratory known as BTev. BTev was one of 20 facilities included in the Office of Science 20-year facilities plan released last year. A DOE scientific advisory panel recommended that if the project was not initiated by 2008, it should be canceled in favor of other pending large facilities proposals. The budget request no funds for construction of the Rare Isotope Accelerator (RIA), a nuclear physics facility accorded relatively high priority in the 20-year facilities plan. The budget requests \$4 million for RIA-related R&D in FY06. (A site for RIA has not been selected; Argonne National Laboratory and Michigan State University are the finalists.)

The request for fusion R&D is up \$17 million overall, (+ 6 percent, to \$291 million) with funding for ITER (an international partnership to build a large-scale fusion reactor) up \$51 million (+113 percent to \$56 million), although site negotiations have been stalled for more than a year as France and Japan compete to host the project. The large increase for ITER could result in reduced funding for basic fusion research and curtailed operating time on existing fusion facilities in the U.S.

In other program changes, the budget proposes a \$126 million reduction in funding for Biological and Environmental Sciences (-22 percent to \$456 million) with proposed cuts targeted primarily in the Medical Applications and Measurement area that hosts numerous Congressional earmarks. The budget also proposes a \$25 million reduction for Advanced Scientific Computing (-11 percent to \$207 million). On the other hand, the budget proposes a \$20 million increase (+28 percent to \$87 million) for Genomics.

Applied Energy Programs

The FY06 budget proposes reduced funding for energy efficiency and renewable energy (EERE) R&D programs while increasing funds for hydrogen R&D. Overall funding for EERE R&D activities is cut \$54 million (-5 percent to \$975 million) but, if the hydrogen/FreedomCar activities are excluded, energy efficiency and renewable energy R&D is cut by 11 percent (\$79 million), to \$687 million, from the FY05 enacted level of \$766 million.

In specific EERE programs, significant cuts were requested for Building Technologies (-12 percent, -\$8 million to \$58 million), Industrial Technologies (-25 percent, -\$18 million to \$57 million), and the Biomass program (-18 percent, -\$16 million, to \$72 million).

In fossil energy, overall funding is cut \$80 million (-14 percent to \$491 million). DOE proposes to eliminate oil and gas technology research, allocating \$10 million to each program for orderly termination

of ongoing activities. Both these programs were scored “Ineffective” by OMB for the last two years. The stationary fuel cell program (Distributed Generation), is cut by \$12 million (-16 percent to \$65 million). In coal programs, there is an overall increase of \$13 million (+4.9 percent to \$286 million), with shifts in programmatic emphasis. Carbon Sequestration gets a requested increase of \$22 million (+48 percent to \$67 million) while the coal-based fuels program is cut \$10 million (-31 percent to \$22 million) and Advanced Research is cut \$10 million (-28 percent to \$31 million). FutureGen, the proposed \$1 billion dollar project to build a zero-emissions coal plant, is funded at \$18 million, the same as last year’s appropriation.

In the nuclear area, funding for civilian activities in Nuclear Energy is up \$15 million, (+4 percent to \$389 million). In the research and development programs, Nuclear Power 2010 is up \$6 million (+13 percent to \$56 million), Generation IV is up \$5 million (+13 percent to \$45 million) and Nuclear Hydrogen up \$11 million (+124 percent to \$20 million). The Nuclear Energy Plant Optimization program and the Nuclear Energy Research Initiative are not funded.

The Office of Electric Transmission and Distribution and Energy Assurance receives a \$25 million decrease (-20 percent to \$96 million), with the majority of the cut (-\$20 million) coming from R&D programs.

Issues/Questions Raised by the FY06 Request for DOE

Hydrogen R&D: The budget requests a significant increase for R&D for hydrogen as a fuel for transportation, while reducing funds for energy efficiency and renewable energy R&D. In addition to questions raised at the front of this charter, the focus on hydrogen raises an additional question. Hydrogen must be produced from other energy sources, so if renewable energy research is not well supported, it may not be possible to produce hydrogen in the quantities necessary for transportation without relying on imported energy.

Facilities vs. Research Grants: Traditionally DOE has maintained a balance between research grants and laboratory activities. Since DOE is the leading source of civilian physical sciences research funding, as well as a large portion of other civilian basic research, the reduction of grants to enable user facilities to continue to operate raises a fundamental question about the role of the Office of Science. Should the Department focus on providing the large-scale equipment and facilities that scientists need and leave the funding of individual experiments to others (whether inside or outside government), or should the department strive to have a mix of both research grants and facilities accessible to users?

Table 1.

Department of Energy Civilian R&D
FY 2006 Budget Request (dollars in millions)
(Source: Department budget justification)

Account	FY04 Enacted	FY05 Request	FY05 Approps	FY06 Request	FY05-06 change	FY05-06 percent
Science	3523	3432	3600	3463	-137	-4%
HEP	716	737	736	714	-22	-3%
NP	380	401	405	371	-34	-8%
BER	624	502	582	456	-126	-22%
BES	991	1064	1105	1146	41	4%
ASCR	197	204	232	207	-25	-11%
FES	256	264	274	291	17	6%
Other (1)	359	260	266	279	13	5%
FE R&D	659	636	572	491	-81	-14%
EERE R&D	1003	960	1023	975	-48	-5%
EE	651	585	643	621	-22	-3%
RE	352	375	380	354	-26	-7%
NE	327	388	375	390	15	4%
ETD	101	102	119	96	-23	-19%
Total	5613	5518	5689	5415	-274	-5%

(1) Other includes program direction, laboratories infrastructure, and other activities.

(2) R&D programs only - not including accounting changes for clean coal

(3) Does not include non-civilian nuclear activities

Key to Abbreviations

Science

HEP	High Energy Physics
NP	Nuclear Physics
BER	Biological and Environmental Research
BES	Basic Energy Sciences
ASCR	Advanced Scientific Computing Research
FES	Fusion Energy Science

FE Fossil Energy (in Energy Conservation for now)

FERD Fossil Energy Research and Development Account

EERE Office of Energy Efficiency and Renewable Energy

RE Renewable Energy (in Energy Supply account)

EE Energy Efficiency (in Energy Conservation account for now)

NE Nuclear Energy Science and Technology (in Energy Supply account)

ETD Electric Transmission and Distribution

National Science Foundation (NSF)

The National Science Foundation is the primary source of federal funding for non-medical basic research conducted at colleges and universities and serves as a catalyst for science, technology, engineering, and mathematics education reform at all levels.

The FY06 budget request for NSF is \$5.61 billion, an increase of 2.4 percent, or \$132 million over the FY05 level. However, because NSF received a 3.1 percent (\$180 million) cut in FY05, the overall request level for FY06 is approximately 1 percent below the FY04 level. Also, the budget requests overstates the increase in NSF's actual buying power because it includes \$48 million for NSF to begin paying for Coast Guard activities in Antarctica that had previously been paid for by the Coast Guard.

For the second year in a row, the largest percentage increases in the budget proposal are for personnel, administrative initiatives, and construction of major research facilities. Specifically, the Research and Related Activities (RRA) account, which funds most NSF research programs, receives a 2.7 percent increase (including the Coast Guard funds).⁷ The Education and Human Resources (EHR) Directorate, as mentioned earlier, receives a 12 percent cut.

NSF continues to receive high marks from the Office of Management and Budget for the quality of its management and the excellence of its programs. Building on its performance in the FY05 budget, NSF was one of only seven agencies awarded three green lights on the Executive Branch Management Scorecard. In addition, eight NSF programs were examined using the Program Assessment Rating Tool (PART)⁸. All eight programs received ratings of "Effective" (the highest rating). NSF was the only agency in the Federal government to receive the highest rating on every program that was "PART-ed."

Issues/Questions Raised by the FY05 Request for NSF

Education and Human Resource Directorate (EHR)

Of the seven budget categories within the Education and Human Resources Directorate, four receive major budget cuts ranging from 12 to 43 percent (table 2): Math and Science Partnerships (MSP), Elementary, Secondary, and Informal Education (ESIE), Undergraduate Education (DUE), and Research, Evaluation, and Communication (REC). Most programs within these accounts are planning reductions in the number of new awards in 2006, and two – MSP and REC – will not make any new awards.

The Department of Education also runs an MSP program. (Both were created by Congress as part of the No Child Left Behind initiative). The Education Department program receives a proposed FY06 increase of \$91 million to \$269 million, but it is significantly different from its NSF counterpart. The Department of Education's program awards funds to states on a formula basis and focuses primarily on high-level level mathematics while NSF's program provides competitive, merit-reviewed grants to universities and school districts to improve math and science proficiency for students of all grades.

⁷ The transfer was proposed in an attempt to address ongoing disagreements between NSF and the Coast Guard regarding the proper cost to the Coast Guard of conducting icebreaking activities. NSF faces both short- and long-term questions regarding icebreaking operations. In the short-term, it remains unclear whether \$48 million is a sufficient amount to pay for the activities. In the long-term, Congress and the Administration must consider how best to replace the current ice-breaking ships, which are aging rapidly.

⁸ PART is described by the budget as a tool "developed to assess and improve program performance so that the Federal government can achieve better results. A PART review helps identify a program's strengths and weaknesses to inform funding and management decisions aimed at making the program more effective."

Investments in graduate education and in human resource development, or activities to broaden participation in STEM fields, fare better. In graduate education, the request of \$155 million will enable NSF to maintain its current stipend of \$30,000 for top graduate students and further broaden participation in these programs. In human resource development, the funding request of \$118.4 million will provide ongoing support for programs and activities that expand opportunities for traditionally underserved populations.

Major Research Equipment and Facilities Construction (MREFC): The FY06 budget request proposes \$250 million for this account, \$76 million (44 percent) above the FY05 level for this account, which funds large user facilities. (NSF provides funding to private entities, usually university consortia, to run the facilities.) The FY06 budget provides money for no new starts despite a backlog of projects. Five major facilities have been completed in the past two years. Each completed facility, such as the new research station at the South Pole, requires support for research as well as operations and maintenance funding once it comes on line. Those funds come out of NSF's research budget. Consequently, as MREFC projects begin operations, increasing budget pressure is placed on core research activities. NSF faces a difficult and growing challenge in balancing these two needs.

Grant Proposal Success Rate: Even as the total funding for NSF has increased significantly over the past six years (up 40 percent), the percentage of funded proposals has declined from 33 percent in FY00 to an estimated 20 percent in FY05. For FY06, NSF has set a goal of halting the decline in the success rate while maintaining grant size and duration. Given this constraint, and the relatively flat budget requested, NSF will try to reduce the number of proposals it receives, in part by reducing the number of solicitations the agency issues.

Table 2.

National Science Foundation
FY 2005 Budget Request (dollars in millions)
(Source: Agency Budget Justification)

Account	FY04 Actual	FY05 Current Plan	FY06 Request	Change FY05 to FY06	
				Amount	Percent
RRA	4293	4221	4333	113	2.7%
BIO	587	577	582	5	0.9%
CISE	605	614	621	7	1.1%
ENG	566	561	581	19	3.5%
GEO	713	694	709	15	2.2%
MPS	1092	1070	1086	16	1.5%
SBE	184	197	199	2	1.0%
OISE	41	34	35	1	2.3%
OPP	342	344	387	43	12.4% ⁹
IA	164	130	135	5	3.8%
EHR	944	841	737	-104	-12.4%
MREFC	184	174	250	76	44.0%
S&E	219	223	269	46	20.5%
OIG	9	10	12	1	14.7%
NSB	2	4	4	0	0.8%
Total	5652	5473	5605	132	2.4%

Acronyms:

RRA = Research and Related Activities
EHR = Education and Human Resources
MREFC = Major Research Equipment and Facilities Construction
S&E = Salaries & Expenses
OIG = Office of Inspector General
NSB = National Science Board
BIO = Biological Sciences
CISE = Computer & Information Science & Engineering
ENG = Engineering
GEO = Geosciences
MPS = Mathematical and Physical Sciences
SBE = Social, Behavioral, and Economic Sciences
OISE = Office of International Science and Engineering
OPP = Office of Polar Programs
IA = Integrative Activities

⁹ Includes \$48 million transfer from the Coast Guard for ice-breaking activities.

Table 3.**NSF Education and Human Resources Directorate**

FY 2006 Budget Request (dollars in millions)

(Source: Agency budget justification)

Account	FY04 Actual	FY05 Current Plan	FY06 Request	Change FY05-06 \$	Change FY05-06 %
EISE	206	182	141	-41.2	-23 %
IMD	29	29	19	-9.6	-33 %
TPC	62	60	33	-27.2	-45 %
CLT	27	26	22	-4.5	-17 %
MSP	139	79	60	-19.4	-24 %
Undergrad	163	154	135	-18.7	-12 %
SfS	16	14	10	-4.1	-29 %
CCLI	40	46	31	-9.6	-23 %
Graduate	155	155	155	0.3	0.2 %
HRD	120	119	119	-0.1	-0.1 %
CREST	14.9	15.9	18.5	2.6	16 %
MIE	2.5	2.5	0	-2.5	-100%
EPSCOR	94.2	94	94	0.3	0.3 %
REC	66.4	59	33.8	-25.7	-43 %
TOTAL	944	841	737	-104	-12 %

*Not a complete list of education programs.

Acronyms:

EISE – Elementary, Secondary and Informal Education

IMD – Instructional Materials Development

TPC – Teacher Professional Continuum

CLT – Centers for Learning and Teaching

SfS – Scholarship for Service

CCLI – Course, Curriculum and Laboratory Improvement

MSP – Math and Science Partnership Program

HRD – Human Resource Development

CREST – Centers for Research Excellence in Science and Technology

MIE – Model Institutions for Excellence

EPSCoR – Experimental Program to Stimulate Competitive Research

REC – Research, Evaluation and Communication

Homeland Security R&D

Homeland Security R&D at the Department of Homeland Security (DHS)

The vast majority of R&D at DHS is funded by the Science and Technology (S&T) directorate. Proposed funding for S&T is \$1.37 billion, an increase of \$253 million (23 percent) above the FY05 enacted level. Approximately half of this increase is not for new research, but reflects the proposed transfer into the S&T directorate of existing science programs that are now run by other parts of DHS, particularly by the Transportation Security Administration. The Science Committee has encouraged this consolidation. Even after this transfer is taken into account, the funding for DHS S&T still increases by \$126 million (11%).

One major new initiative within DHS S&T is the formation of a Domestic Nuclear Detection Office (DNDO) (\$227 million, of which \$124 million is new funding). The DNDO will be located at DHS, but will include representatives from other agencies, such as DOE and DOD. The Office will be responsible for R&D related to detection of nuclear and radiological materials, but will also coordinate the acquisition and deployment of a national domestic nuclear detection system and the establishment of protocols and training for users of detection equipment. Other new initiatives in DHS S&T include a new program on detection of certain chemical agents and initial work on a national bio- and agro-defense facility.

S&T Directorate funding is split among various technical portfolio areas, such as biological countermeasures, standards, critical infrastructure protection, and support of conventional DHS missions (such as the Secret Service); a complete list of portfolios and their funding is provided in table 3. Most of the portfolio areas, other than those directly involved in the initiatives described above, remain flat or decrease slightly.

Homeland Security R&D at Other Agencies

Approximately \$2.8 billion is proposed for homeland security R&D programs in departments and agencies outside of DHS (Table 10). The bulk of this funding, \$1.8 billion (up 3.2 percent from FY05), is for bio-defense programs at NIH, such as basic research on infectious microbial agents, applied research on diagnostics, vaccines, and therapies, and construction of bio-safety facilities. The remaining funds (approximately \$1.1 billion) go to a number of other agencies, such as: EPA, for research on detection of chemical and biological agents in the water supply; NSF, for research related to critical infrastructure protection and microbial genomics; the U.S. Department of Agriculture (USDA), for research on animal disease diagnostics and vaccines; DOD for detection systems, protective gear, and vaccines for biological and chemical agents; and DOE's National Nuclear Security Administration for research on detection and attribution of radiological and nuclear materials.

In addition to individual agency programs, a number of cooperative efforts between DHS and other agencies exist: NSF and DHS jointly fund a cybersecurity testbed; DHS provides funding to NIST for standards work in a number of areas, such as standards for radiation detectors; and EPA and DHS co-fund a university center on microbial risk assessment.

Issues/Questions Raised by the FY06 Request for DHS

Balance of DHS S&T Programs: Most of the work of the Directorate is heavily weighted toward development. Relatively little goes to fund longer-term, more basic research. As a result, relatively little of the funding is available to universities, although DHS S&T does fund several university centers. Whether this shorter-range focus is optimal for U.S. long-term security has been a matter of debate.

Table 4.

**Department of Homeland Security
Science and Technology Directorate**
FY 2005 Budget Request (dollars in millions)
(Source: Agency Budget Justification)

Account	FY04 Actual	FY05 Enacted	FY06 Request	Amount Change	Percent Change
Biological Countermeasures (including NBACC & PIADC)	459	398	362	-35	-8.9%
Nuclear & Radiological Countermeasures	106	123	19	-104	-84.4%
Domestic Nuclear Detection Office			227	227	NA
Chemical Countermeasures	23	53	102	49	92.5%
High Explosives Countermeasures	7	20	15	-5	-25.4%
Threat and Vulnerability, Testing and Assessment	59	66	47	-19	-28.6%
Counter-ManPADS	17	61	110	49	80.3%
Support of DHS Conventional Missions	21	55	94	39	71.4%
Rapid Prototyping Program	68	76	21	-55	-72.5%
Standards/State and Local Programs	32	40	36	-4	-10.6%
Emerging Threats	11	11	11	0	-2.3%
University Centers & Fellowship Programs	22	70	64	-6	-9.1%
Cybersecurity	10	18	17	-1	-7.2%
Critical Infrastructure Protection	12	27	21	-6	-23.0%
Interoperability & Communications	0	21	21	-1	-2.4%
SAFETY Act Implementation	0	10	6	-4	-44.0%
Transferred RDT&E Programs*	0	0	117	117	NA
Unobligated Balance	22	0	0	0	NA
Administration/Salaries	44	69	81	13	18.7%
Total	913	1115	1368	253	22.7%

*The RDT&E programs transferred into DHS S&T from elsewhere in DHS are mostly from the Transportation Security Administration, with some funds also from the U.S. Coast Guard, Customs & Borders Protection, and The Infrastructure Protection unit.

Acronyms:

NBACC = National Biodefense Analysis and Countermeasures Center

PIADC = Plum Island Animal Disease Center

ManPADS = Man Portable Air Defense Systems

RDT&E = Research, Development, Test, and Evaluation

NA = Not Applicable

Note: The request for DHS S&T presents proposed and past funding levels by technical topic, not by organizational unit or research performer. To supplement the "portfolio area" information in the budget request, DHS has provided approximate estimates for how funds will be distributed among research performers in FY05: funding for the private sector will be about \$650 million (with roughly \$290 million distributed via HSARPA), funding for the national laboratories will be about \$250M, funding for university centers of excellence and individual student fellowships will be \$72 million, and funding provided to other government agencies will be about \$80 million.

National Institute of Standards and Technology (NIST)

NIST's Laboratory Programs

The FY06 budget requests \$426 million for a wide range of research conducted at NIST laboratories in Gaithersburg, Maryland, and Boulder, Colorado. The request is \$47 million (12 percent) above the FY05 enacted level of \$378 million, and is slightly above the FY05 request. NIST's budget was severely cut in FY04, leading to early retirements and disruption of NIST's program activities. The FY05 appropriation restored enough funding to maintain current programs and personnel.

The Administration's request for FY06 includes \$40 million for initiatives in three broad thematic areas: Advances in Manufacturing (\$20 million), Measurements and Standards for Homeland Security (\$3 million), and New Measurement Horizons for the U.S. Economy and Science (\$17 million).

The Advances in Manufacturing initiative is intended to strengthen U.S. efforts to commercialize nanotechnology, to improve software to better coordinate the activities of all the suppliers involved in manufacturing a particular product, and to improve U.S. competitiveness by making sure that technical standards abroad do not disadvantage U.S. products. Measurements and Standards for Homeland Security will fund a permanent research program at NIST in biometrics (the use of equipment to identify people by such biological means as fingerprints, iris patterns, etc.), and the development of better standards for equipment for firefighters and other first responders. New Measurement Horizons for the U.S. Economy and Science will increase NIST research in such areas as biotechnology and quantum computing – fields in which the U.S. needs to establish and sustain a leadership role if it is to be competitive.

Issues/Questions Raised by the FY06 Request for NIST

National Nanomanufacturing and Nanometrology Facility (N3F): To open its new manufacturing laboratory to nanotechnology users outside the government, NIST needs specialized equipment, and a dedicated budget to maintain the facilities. Although the FY06 budget requests the maintenance funding, the request for equipment is much less than the \$25 million requested (but not appropriated) for FY05. As a result, the N3F may not be sufficiently equipped to support the goals of the National Nanotechnology Initiative.

Impact of Proposed Elimination of the Advanced Technology Program (ATP): The FY06 budget request proposes to eliminate ATP, but provides no funds for the orderly shut down of the program, including the costs to reassign or eliminate 228 positions. These costs could be as high as \$20 million. Moreover, ATP is expected to fund an estimated \$13 million worth of R&D conducted at the NIST laboratories in FY05. Therefore, the proposal to end ATP could result in one-time costs to NIST of up to \$33 million, eating up much of the proposed increase for the NIST laboratories.

Impact of Scaling Back the Manufacturing Extension Partnership (MEP) Program: The FY06 request for MEP is \$46.8 million, which represents about a 60 percent cut from the FY05 enacted level of \$109 million. At this level, it is unclear how the MEP program would function as a national network.

Table 5.**National Institute of Standards and Technology**

FY 2006 Budget Request (budget in millions)

(Source: Agency Budget Justification)

Account	FY 2004 Enacted	FY 2005 Enacted	FY 2006 Request	Amount Change	Percent Change
EEE	44.1	48.9	50.8	1.9	3.9%
ME	21.5	23.4	28.0	4.5	19.4%
CST	43.5	43.3	52.4	9.0	20.9%
Phys	38.5	41.2	46.7	5.4	13.3%
MSE¹	54.5	60.0	33.5	-26.5	-44.2%
BFR	19.5	21.4	24.3	2.8	13.2%
CSAM	50.8	62.9	68.4	5.4	8.7%
STS	15.4	15.3	20.1	4.7	30.9%
RS²	45.1	56.4	48.3	-8.1	-14.4%
BQP	5.4	5.3	5.6	0.2	4.9%
Facilities					
CNR	0	0	29.5	29.5	--
N3F	0	0	16.0	16.0	--
Construction	64.2	72.5	58.8	-13.6	-18.8%
ITS					
ATP	177.3	140.3	0	-140.3	-100.0%
MEP	39.1	107.5	46.8	-60.7	-56.5%
TOTAL	619.4	699.2	529.6	-169.5	-24.3%

¹The \$26.5 million decrease in the Materials Science and Engineering account is due to moving the Center for Neutron Research (CNR) into a new, separate account.

²The \$8.1 million decrease in Research Support account and the \$13.6 million reduction in the Construction account is due to the removal of FY05 congressional earmarks from the FY 2006 President's request.

Acronyms:

EEE = Electronics and Electrical Engineering
 ME = Manufacturing Engineering
 CST = Chemical Science and Technology
 Phys = Physics
 MSE = Materials Science and Engineering
 BFR = Building and Fire Research
 CSAM = Computer Science and Applied Mathematics
 STS = Standards and Technology Services
 BQP = Baldrige Quality Program
 RS = Research Support
 CNR = Center for Neutron Research
 N3F = National Nanotechnology and Nanometrology Facility
 ITS = Industrial Technology Services
 ATP = Advanced Technology Program
 MEP = Manufacturing Extension Partnership

National Oceanic and Atmospheric Administration (NOAA)

The FY06 budget requests \$3.6 billion for NOAA, a decrease of \$300 million (8 percent) compared to the FY05 enacted level of \$3.9 billion. However, NOAA's FY05 budget includes approximately \$430 million worth of Congressionally mandated projects. If these earmarks are removed from the FY05 baseline, then the President's budget could be construed as proposing an additional \$200 million (6 percent increase) for NOAA in FY06.

National Weather Service

The FY06 budget requests \$839 million for the National Weather Service (NWS), an increase of \$56 million (7 percent). The request includes \$8.7 million to expand and modernize technology capabilities at the NWS, including upgrades to the NOAA Weather Radio All-Hazards warning network, a new drought forecasting initiative, and upgrades to the supercomputers used in weather forecasting.

Tsunami Warning and Detection System

The FY06 budget request includes \$9.5 million for NOAA to expand the U.S. Tsunami Warning Network, an issue considered by the Committee during a hearing on January 26, 2005. This request, combined with \$14.5 million in supplemental funds in FY05, will allow NOAA to procure and deploy tsunami detection buoys in a system designed to provide continuous tsunami warning capability for both the Pacific and Atlantic coasts of the United States and in the Caribbean.

Satellite Acquisition

The FY06 budget requests \$964 million for satellite programs at NOAA. This request is a \$57 million (6 percent) increase over the FY05 enacted level of \$907 million. The increase is for procurement, acquisition, and construction of the next generation of weather satellites, and is in line with the long-term budget plans for these satellite systems. NOAA's polar-weather satellites are vital for three to seven day weather forecasts, tracking of severe weather such as hurricanes, and for climate observations. The next-generation of polar satellites is currently under development, with the first launch planned for 2010.

Issues/Questions Raised by the FY06 Request for NOAA

Weather Satellite Cost Increases: In September 2004, the Government Accountability Office (GAO) completed a report for the Committee on the costs and risks associated with NOAA's next-generation polar satellite program. The current projection for the cost of the next generation polar satellite system has risen from \$6.5 billion to \$8.1 billion and GAO estimates it is likely to rise by another \$500 million before the system is complete. The Committee recently learned that availability one of the key sensors on the new polar satellite will be delayed by 16 months due to technical difficulties in developing the sensor. Cost overruns in satellite programs could force NOAA to take resources away from other important core missions at the agency.

Tsunami Warning Network: While the FY06 budget (along with the FY05 supplemental appropriations request) funds the purchase of new tsunami detection buoys, funding in the out-years for the operation and maintenance of the proposed tsunami warning system is uncertain. Each buoy costs approximately \$500,000 to purchase and deploy and has a design life of less than two years, so NOAA's estimated \$350,000 for annual operation and maintenance seems inadequate. Also, funding is uncertain for tsunami education and outreach programs, which witnesses told the Committee are as important as tsunami detection in preventing deaths.

Table 6.

National Oceanic & Atmospheric Administration

FY 2006 Budget Request (dollars in millions)

(Source: Agency budget justification)

Account	FY04 Actual	FY05 Enacted	FY06 Request	Percent Change
NOS	606	669	415	-38.0%
ORF ¹	505	541	394	-27.2%
PAC ²	100	127	15	-88.2%
Other	1	1	6	500.0%
OAR	414	414	372	-10.1%
ORF	393	404	362	-10.4%
PAC	21	10	10	0.0%
Other	0	0	0	0.0%
NWS	825	783	839	7.2%
ORF	722	704	745	5.8%
PAC	103	79	94	19.0%
Other	0	0	0	0.0%
NESDIS	827	907	964	6.3%
ORF	152	176	154	-12.5%
PAC	675	731	810	10.8%
Other	0	0	0	0.0%
Program Support ¹	363	449	398	-11.4%
ORF	305	368	344	-6.5%
PAC	40	64	36	-43.8%
Other	18	18	18	0.0%
NMFS	760	824	728	-11.7%
Transfers	(\$106)	(\$128)	(\$130)	----
Total	3690	3918	\$3,586	-8.5%

ORF = Operations, Research and Facilities

PAC = procurement, Acquisition and Construction

¹ Includes Fleet and Aircraft Maintenance and NOAA HQ
Accounts

² National Marine Fisheries Service is budgeted under NOAA, but is under jurisdiction of the Resources
Committee

8. Witnesses Questions

Witnesses have been asked to:

1. Review the R&D budget request in the context of the Administration's overall priorities in science and technology.
2. Describe the mechanisms that the Administration uses to determine priorities across scientific disciplines.
3. Describe the mechanisms the Administration uses to coordinate its scientific research and technical development activities with other Federal agencies.

APPENDIX I: Budget Tables for Selected Interagency Programs.

Table 7. National Nanotechnology Initiative

(Dollars in Millions)

	FY04 Actual	FY05 Estim.	FY06 Proposed	Change FY05-06	
				Amount	Percent
NSF	256	338	344	6	1.8%
Defense	291	257	230	-27	-10.5%
Energy	202	210	207	-3	-1.4%
NIST	77	75	75	0	0.0%
NASA	47	45	35	-10	-22.2%
NIH/NIOSH	108	145	147	2	1.4%
EPA	5	5	5	0	0.0%
DHS	1	1	1	0	0.0%
USDA	2	3	8	5	166.7%
Justice	2	2	2	0	0.0%
Total	991	1081	1054	-27	-2.5%

(Source: Federal budget analytical perspectives, page 69)

Acronyms

NIH = National Institutes of Health

NIOSH = National Institute for Occupational Safety and Health

USDA = U.S. Department of Agriculture

Table 8. Networking and Information Technology R&D

(dollars in millions)

	FY04 Actual	FY05 Estim.	FY06 Proposed	Change FY05-06	
				Amount	Percent
Defense	241	278	299	21	7.6%
NSF	773	795	803	8	1.0%
HHS	542	589	569	-20	-3.4%
Energy	343	370	341	-29	-7.8%
Commerce	47	58	62	4	6.9%
NASA	258	163	74	-89	-54.6%
EPA	2	4	6	2	50.0%
Total	2206	2256	2155	-101	-4.5%

Totals may not add, due to rounding.

(Source: Supplement to the Budget: Guide to the NITRD Program FY05-FY06)

Acronyms

HHS = Department of Health and Human Services

APPENDIX I: Budget Tables for Selected Interagency Programs. (Continued)

Table 9. Climate Change Science Program

(dollars in millions)

	FY04 Actual	FY05 Estimate	FY06 Request	Change FY05-06	
				Amount	Percent
NSF	215	198	197	-1	-1%
Energy	133	129	132	3	2%
Commerce	116	124	181	57	46%
USDA	70	73	88	15	21%
Interior	28	24	24	0	0%
EPA	22	20	21	1	5%
NIH	61	65	65	0	0%
NASA	1321	1264	1162	-102	-8%
All Other	14	16	16	0	0%
Total	1980	1913	1886	-27	-1%

(Source: Federal budget analytical perspectives, page 69)

Table 10. Homeland Security R&D

(dollars in millions)

	FY04 Estimate	FY05 Estimate	FY06 Request	Change FY05-06	
				Amount	Percent
HHS	1,643	1,608	1,766	158	9.8%
DHS	816	1,017	1,227	210	20.6%
Defense	267	362	394	32	8.8%
NSF	318	324	328	4	1.2%
Justice	49	61	109	48	78.7%
USDA	22	31	67	36	116.1%
Commerce	17	59	62	3	5.1%
Energy	19	32	52	20	62.5%
EPA	30	25	40	15	60.0%
Treasury	3	3	3	0	0.0%
Transportation	0	0	1	1	N/A
Total	3,185	3,522	4,048	526	14.9%

Totals may not add, due to rounding.

(Source: Office of Management and Budget)

APPENDIX II:

Federal R&D Spending (adapted from FY06 Budget Request)*

By Agency	2004 Actual	2005 Estimate	2006 Proposed	\$ Change 05-06	% Change 05-06
Defense	65,462	70,422	70,839	417	1%
Health and Human Services	28,047	28,752	28,807	55	0%
NASA	10,574	10,990	11,527	537	5%
Energy	8,779	8,629	8,528	-101	-1%
National Science Foundation	4,160	4,082	4,194	112	3%
Agriculture	2,222	2,415	2,039	-376	-16%
Homeland Security	1,053	1,185	1,467	282	24%
Commerce	1,137	1,134	1,013	-121	-11%
Transportation	661	748	808	60	8%
Veterans Affairs	866	784	786	2	0%
Interior	627	615	582	-33	-5%
Environmental Protection Agency	661	572	569	-3	-1%
Other	1,089	1,243	1,145	-98	-8%
Total	125,338	131,571	132,304	733	1%
Basic Research					
Defense	1,358	1,513	1,319	-194	-13%
Health and Human Services	14,780	15,124	15,246	122	1%
NASA	2,473	2,368	2,199	-169	-7%
Energy	2,847	2,887	2,762	-125	-4%
National Science Foundation	3,524	3,432	3,480	48	1%
Agriculture	829	851	788	-63	-7%
Homeland Security	68	85	112	27	32%
Commerce	43	58	71	13	22%
Transportation	20	38	41	3	8%
Veterans Affairs	347	315	315	0	0%
Interior	37	36	30	-6	-17%
Environmental Protection Agency	113	66	70	4	6%
Other	149	155	175	20	13%
Subtotal	26,588	26,928	26,608	-320	-1%
Applied Research					
Defense	4,351	4,851	4,139	-712	-15%
Health and Human Services	13,007	13,274	13,410	136	1%
NASA	3,006	2,497	3,233	736	29%
Energy	2,693	2,760	2,709	-51	-2%
National Science Foundation	266	279	276	-3	-1%
Agriculture	1,055	1,093	942	-151	-14%
Homeland Security	247	346	399	53	15%
Commerce	828	825	763	-62	-8%
Transportation	349	423	494	71	17%
Veterans Affairs	476	430	433	3	1%
Interior	538	530	495	-35	-7%
Environmental Protection Agency	423	365	386	21	6%
Other	599	562	553	-9	-2%
Subtotal	27,838	28,235	28,232	-3	0%
Development					
Defense	59,701	63,903	65,331	1,428	2%
Health and Human Services	41	54	28	-26	-48%
NASA	3,189	3,727	3,511	-216	-6%
Energy	1,992	1,846	1,959	113	6%
National Science Foundation	N/A	N/A	N/A	N/A	N/A
Agriculture	159	157	146	-11	-7%
Homeland Security	481	599	746	147	25%
Commerce	152	149	90	-59	-40%
Transportation	279	269	254	-15	-6%
Veterans Affairs	43	39	38	-1	-3%
Interior	49	46	54	8	17%
Environmental Protection Agency	125	141	113	-28	-20%
Other	324	495	396	-99	-20%
Subtotal	66,535	71,425	72,666	1,241	2%

*Columns are incomplete due to omission of additional R&D activities of certain agencies